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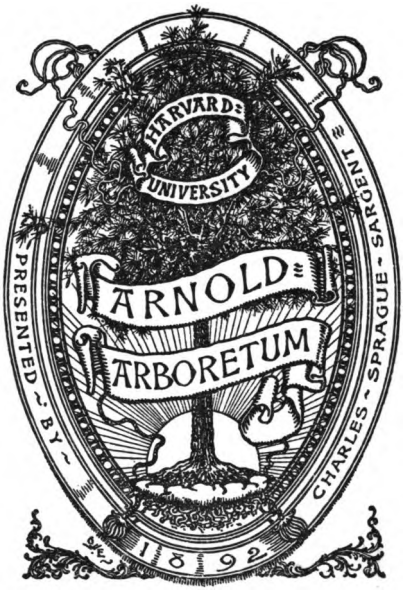

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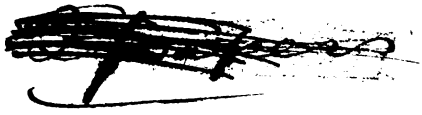

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RURAL PRIMARY SCHOOLS OF SCIENCE, AGRICULTURE, FORESTRY, AND RURAL ECONOMY.

By the Rev. J. C. BROWN, LL.D.

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Rural Primary Schools of Science, Agriculture, Forestry, and Rural Economy.

By the Rev. J. C. BROWN, LL.D.

In a preceding paper I have given expression to my opinion that the great difficulty anticipated by me as likely to be encountered in the establishment of a National School of Forestry is that of procuring students. There are lucrative appointments in the forest service of India; but the pre-requisites are such that few if any of the sons of foresters, nurserymen, and gardeners, familiar with trees from their youth up, can have thoughts of aspiring to these. New Zealand, South Australia, Mauritius, and it may be others of our colonies, have begun to manifest a resolution to secure the conservation, extension, and scientific exploitation of their forests. But there has not yet arisen such a demand for scientific educated foresters as to arrest public attention. It is in such places much more than at home that an acquaintance with the advanced forest science and forest economy of continental Europe is required; and while far more importance is attached by me to practical acquaintance with arboriculture than to such an acquaintance with it as may be acquired from books alone, I hold that the two may be combined, with an advantage which may be represented as more like the product of numbers multiplied the one by the other, than the sum of the two added together.

I honour the high attainments of many of our foresters; but I feel with many that, in comparison with the trained and educated scientific foresters on the Continent, they look at the work they have got to do in a way altogether different. They know what to do, and they do it, and do it well; but reasons assigned for what is done are often at variance with what are known by others to be matters of fact; and the discovery of the right way of doing what should be done may have been acquired at great cost to some one, not the forester perhaps, but the proprietor, or some one else.

Dr. Matthew Arnold, writing on another subject, or rather another department of this subject, makes some remarks which I may cite in illustration of what I am saying. In his volume, entitled "Higher Schools and Universities in Germany," he says, "I doubt whether two hundred people in this country have read Mr. Pattison's report or mine on the popular schools of the Continent, simply because the notion of treating a matter of this kind as a matter of scientific study hardly occurs to any one in this country, but almost every one treats

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it as a matter which he can settle by the light of his own personal experience, and of what he calls his practical good sense.

"Our rule of thumb has cost us dear already, and is probably destined to cost us dearer still. It is only by putting an unfair and extravagant strain on the wealth and energy of the country that we have managed to hide from ourselves the inconvenience we suffer, even in the times when we think ourselves most successful, from our want of systematic instruction and science. I was lately saying to one of the first mathematicians in England, who has been a distinguished senior wrangler at Cambridge and a practical mechanician besides, that in one department at any rate—that of mechanics and engineering—we seemed, in spite of the absence of special schools, good instruction, and the idea of science, to get on wonderfully well. 'On the contrary,' said he, 'we get on wonderfully ill; our engineers have no real scientific instruction, and we let them learn their business at our expense by the rule of thumb, but it is a vicious system of blunder and plunder. A man without the requisite scientific knowledge undertakes to build a difficult bridge; he builds three which tumble down, and so learns how to build a fourth which stands; but somebody pays for the three failures. In France or Switzerland he would not have been suffered to build his first bridge until he had satisfied competent persons that he knew how to build it, because abroad they cannot afford our extravagance. The scientific training of the foreign engineers is therefore perfectly right. Take the present cost per mile of the construction of an English railway, and the cost per mile as it was twenty years ago; and the comparison will give you a correct notion of what rule-of-thumb engineering, without special schools and without scientific instruction, has cost the country.'"

I let the engineer cited state the result of his observations; I cannot gainsay what he has said, and accepting his testimony, I avail myself of it for purposes of illustration. I have seen in colonial forests great waste, at which cost experience has been gained; and the forester has died or has been removed, and again at great waste experience has been gained by his successor; but this experience will probably die or be again lost by his removal. At home what is gained by experience may be put on record, or transmitted from the old forester to the young assistant and successor; but the record is not always read and studied, or the transmitted experience treasured and improved; and successive generations are ever learning, but learning chiefly from experience, but experience without education and training in the art of observation as to what to observe, how to observe it, and how to deduce legitimate conclusions from what has been observed, and without knowledge of what has been observed by others of the natural history of like observations, and ascertained in regard to laws by which they are regulated, and the renewed experience is acquired at great cost to some one. By a nobleman, lately deceased, I was told that when he entered on his hereditary possessions his heart was made sick by the sight of the state of the woods and plantations around his mansions. And yet his father was and still is famous for the attention given by

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him to the conservation and improvement of the family estates, and for the impulse given by him to sylviculture and improved forest economy in one of our foreign dependencies.

While penning a preceding paragraph I received, from a lady who has given her attention for years past to the study of the ravages and destruction of trees and cereal crops by insects, a communication relative to insects observed and studied by her on her father's property, which was situated near Chepstow, between the Wye and the Severn, in which she graphically describes what she had seen of the state of the forests in Gloucestershire. She writes to me:—

"In West Gloucestershire, in the comparatively small woods I was acquainted with, the waste was wretched from maltreatment and neglect, and the lack of any principle in the management of them, or forecast to avoid the subsequent lopping off of great limbs, and from decay. In that mild damp climate the decay in the stumps of boughs broken in the frequent south-west gales soon formed basins in which collected the rainfall, which carried the mischief continuously onward into the trunk; and the noble oak timber suffered greatly." And again, "Lest I should seem to speak as if knowing our Gloucestershire wood management more extensively than is the case, I enclose a rough sketch. My father's property measured some 800 acres, and I had an opportunity of seeing the state of the woods in the neighbourhood; but my observations did not extend as far as the Forest of Dean, which suffered extremely at times from attacks of lepidopterous larvæ on the leafage.

"The great point that struck me round Chepstow was the carelessness as to lopping away large arms, and also leaving stumps, whether cut short or broken off by winds, without any attention. You will see by the rough map that we were exposed to the unbroken force of the gales that sweep up the British Channel. Sometimes by accident a bough was so smoothed at the cut that no wet could lodge, or was cut to where a young shoot drew up the sap, and gradually caused a growth of bark over the amputated extremity; but this was by chance, and quantities of stumps were constantly observable in every stage, from the healed edge with the decaying wood enclosed, to the completed injury of decay penetrated to the sound or heart wood.

"Much of the oak timber was simply used for its bark; every few years, all trees of a suitable size were barked standing. These were felled in autumn and the woods left untouched till those should be sufficiently large which were not then considered desirable for stripping. The bark was taken from large trees as well as middle-sized, *rarely from the young ones;* and much damage was caused in the woods by the rough felling of the stripped trunks; many standing trees were thus much broken and injured. The trees were frequently sawn off, and the shoots, pushing vigorously, in time formed new trees on the stools, so that much of the timber was what was locally known as 'stowlers.'

"In the orchards great harm was done by the popular opinion that 'orchard trees should touch.' Standing on a knoll above the Gloucestershire or Monmouthshire orchards in spring or early summer, they were like a sea of blossom, one smooth surface above; and beneath consequently in autumn there were bare boughs with lichens, immense infesting of American blight, and a dank weed growth. It was a great loss (*on principle* in many places), the more to be regretted as there were many particularly good kinds of apples, mainly brought from the orchards round Tintern Abbey, about six miles from Chepstow, and supposed to have been originally brought there whilst it was still a monastic foundation.

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"The great insect enemy of the trees was the larva of the *Cossus ligniperda*. I have taken thirty from a tree myself and seen as many more taken afterwards; we rarely found that of the *Zeuzera æsculi*, but larvæ of the *Scolytus destructor* were enormously plentiful in elm bark, and the *Cerambyx moschatus* injurious in willows. I do not think anything was done to keep the insects in check, either in the case of these or other lepidopterous and coleopterous larvæ, or of the spruce adelges, which were very injurious in some of the fir plantations. On the young trees the pseudo-cones were sometimes really magnificent growths, and the older plantation trees might be seen quite ruined by the multitude of small galls. The *Sirex gigas* was also not very uncommon, passing on the wing in summer, and I once saw it in considerable quantities hatching from a felled fir trunk. The stag-beetle (*Lucanus cervus*) was completely unknown in the neighbourhood, but its place (in decaying timber) was taken by the *Dorius parallelopipedus* in great numbers."

The whole narrative speaks of waste and destruction, and there are woods and forests in which much that is similar may be observed. I cite the fact as indicative of the cost at which forest management is in some places carried on—if forest management it can be called—through the insufficient supply of properly instructed, educated, and trained foresters; and of the cost at which experience is being acquired.

There seems to be no immediate prospect of the organization of a national School of Forestry in Britain. What a day or what an hour may bring forth we cannot tell; meanwhile there is much which might be done to prepare for advantage being taken of such an institution when it shall be established, and that with benefit to all concerned. While public opinion is being formed and matured on the subject of a national school of instruction, forestry pupils may be being prepared with benefit to themselves and with advantage to landed proprietors and to the community at large. What can be done I wish now to state.

In stating what may be done I have no design to propose what I submit as the only measure which will meet the case, or as the best which may be proposed, but as one by which what I desiderate might be supplied, and that at little cost to any, and with accessary benefit to many.

In the centre of mining and manufacturing industries we find existing in considerable numbers mechanics' institutions and schools of arts, and in several of our seaports schools of navigation, all of them supplementing the existing provision for the education of the young by instruction and education appropriate to the position of those who, having left the primary and public schools, have engaged in the duties of active life, and required additional education and instruction. What I am about to advocate is a like extension of existing educational arrangements in country towns and rural districts, to meet what we desire, either in connection with primary or secondary schools, or in separate schools, either connected with these or independent of them, as may seem most satisfactory in different localities.

There are four such district forest schools in Sweden supported by the Government, and the Government offers help towards the mainte-

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nance of additional forest schools of this kind when local authorities take the initiatory steps to establish them.

Schools somewhat similar have been established in different parts of Russia; and others of a more comprehensive character, including provision for instruction being given in horticulture and agriculture and other departments of rural economy, have been organized in various parts of Austria and Hungary. And it is under an impression that such are in every way more likely to meet the wants of our country, and to be originated and sustained, than schools limited as are the district forest schools of Sweden, that I submit for consideration the existing provision for meeting the expenses of such like schools, should the establishment of any be deemed expedient.

But the suggestion is not confined to the establishment of new schools; public schools already established, whether these be primary or secondary public schools, may be thus utilized. In Sweden, from the report issued in 1867, it appears that in that year 21,850 pupils in the "folk schule," or common school, received instruction in horticulture and tree planting. Nor in this was there anything extraordinary. In the United States of America much has been done in some States to carry out a similar arrangement there. There is nothing to prevent the same thing being done in Britain.

To make more intelligible what I mean by a separate and independent school, such as might be designated a Rural Primary School of Science, Agriculture, Forestry, and Rural economy; and to familiarize the minds of any of my readers with the idea, before proceeding to devote attention to the existing facilities for carrying out the idea, I refer them to arrangements in Sweden for the maintenance of what are called district forest schools, in contradistinction to the *Scogs Institution*, or national school of forestry, which have been previously described.*

By the Science and Art Department of the Committee of Council on Education, grants are made, on reasonable conditions, of pecuniary aid towards meeting the expense of instruction in all branches of physical science and natural history, either in existing schools or in separately organized schools. According to the Directory revised to August, 1877, issued by them, they are prepared to do this in the following ways :—

1. Granting to successful pupils Queen's prizes, scholarships of £5 and £10 per annum, and exhibitions of the value of £25 and £50 per annum.

2. Granting to the committee of management, or to the teacher, payments on results amounting to £1, £2, £3, £4, or more, for each pupil passing successfully prescribed examinations.

3. Granting to teachers teaching in two or more different towns

* *Journal of Forestry*, vol. ii., pp. 473—475. "Glances at Forestry in Northern Europe," p. 5.

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their travelling expenses, and on certain conditions travelling expenses to and from London, and expense of board and lodging there while spending a specified time in making observations or in study.

4. Granting to the committee money in aid of a new building, or in aid of the adaptation of an existing building for a school of science, at a rate not exceeding 2s. 6d. per square foot of internal area, up to a maximum of £500; in aid of purchasing fittings, apparatus, and diagrams, &c., to the extent of half the cost; and capitation payments of 5s. and 10s. per annum for every pupil attending the full course of instruction, and passing in one of the subjects of study laid down for his year.

I am no advocate for prizes, or for payments on results, but it is proper I should state what the arrangements are. These arrangements, in so far as they are applicable, can be carried out in connection with instruction in any one, or any number, of the subjects of study specified. Provision is made in like manner for aiding in meeting the expense of instruction in freehand drawing. When the revised Directory was issued I submitted for consideration whether it might not be expedient for the Department to extend to the teaching of what is known on the Continent as Forest Science succour and encouragement similar to what is given by the Department to the teaching of agriculture. After a time the secretary wrote to me, "After careful consideration their lordships desire me to inform you that forestry does not seem to them to be a subject which could with advantage be added to those sciences towards instruction in which aid is granted by this Department." But a comparison of the list of subjects towards instruction in which aid is offered with the fundamental and accessary sciences taught in schools of forestry on the Continent, all of them, with the exception of Nos. 4, 20, and 21, and perhaps Nos. 18 and 19, are included amongst these; and under the head of General Principles of Agriculture is specified instruction relative to woods and plantations; conditions regulating the selection and luxuriant growth of timber and underwood; and the durability of timber, how increased and how decreased,—subjects which embrace a wide field of study, and subjects a thorough acquaintance with which would at once meet the requirements of assistants to foresters, and supply a good basis for subsequent professional studies.

Hitherto there has not been given to natural history and physical science that prominence as a means of education in our primary and secondary schools which is given to it in Germany and other countries on the continent of Europe, or anything like it. But this is being amended by the arrangement to which I have referred.

Meanwhile, with the funds which the Science and Art Department in connection with the Committee of Council on Education are now supplying, and are prepared to supply, a school of forestry in embryo

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might be organized anywhere at little additional expense, or at still less engrafted on any of the existing schools of science and classes connected with the Department. Of these there are in England some 1,250, in Wales upwards of 40, in Scotland some 120, in Ireland some 160, upwards of 1,500 in all, with from one to six or more certificated teachers, consisting of clergymen and others. Thus it appears that no insuperable difficulty need be anticipated in getting qualified teachers of fundamental and accessary sciences.

The list of members of the Scottish Arboricultural Society, with their addresses, shows that there are in all parts of the country foresters taking an interest in the advancement of forestry, some or many of whom might with benefit to themselves be induced to give elementary and more advanced instruction in forestry in such schools of science.

As a preliminary to steps being taken for the organization of a Rural Primary School of Science, Agriculture, Forestry, and Rural Economy, it may be asked, To what extent does provision exist for supplementing the fees which may be paid, by grants from Government in aid of teaching any or all of the branches of natural history and physical science which may be utilized by such an organization? In other words, What are the branches for satisfactory instruction in which payments are made from the Imperial Treasury?

For information on this point I must refer to the "Directory, with regulations for establishing and conducting Science Schools and Classes, issued by the Science and Art Department of the Committee of Council on Education." But I may state summarily that of studies suitable for the forester there are specified mathematics, including plane and solid geometry, and practical applications of these, and an elementary course of instruction in building, in theoretical mechanics, hydrostatics and pneumatics, chemistry, geology, mineralogy, botany, biology, physical geography, and principles of agriculture, under which head is included "P. 23. Woods and Plantations, conditions regulating the situation and luxuriant growth of timber and underwood; the durability of timber, how increased and how decreased."

In regard to some of the principles of agriculture classed with this, it may be observed that there may be but few of these subjects immediately interesting to the forester; but there are not a few of them bearing directly on his special vocation. Forestry is, even in Britain, an important department of rural economy, and the intelligent forester who is qualified by his studies for acting also as land steward, or as agent of estate management, may find his advice and his assistance in demand.

In connection with what has been stated, I may say I consider that with the provision made by the Science and Art Department of the Committee of Council on Education, we have at command the means of establishing, at little expense beyond the fees which may be charged, district schools which would supply to young foresters or youths aspiring

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to be such, instruction fitting them for their duties, corresponding to, and not inferior to, what is imparted in the District Primary Forest Schools of Sweden, and in similar schools in Russia, in Austria, and elsewhere; and this in combination with some of the advantages arising out of the more comprehensive character which they assume in the latter countries.

I am aware that it is a prevalent opinion amongst foresters, who must know the requirements of their profession much more thoroughly than I may be supposed to do, that a forester can only be trained in the forest, and I have no desire to ignore this fact; and while I advocate the employment of some one to give instruction, or to direct the studies of students on forestry in a National School of Forestry, I consider that this might without great loss be dispensed with in a Primary School of Forestry, such as I have treated of, and that for the following reason: I look here mainly to the education and preparatory instruction required to fit the young forester to profit by the instruction received in the forest. In *The Colonies and India*, issued 15th March, 1879, there appeared a communication on English *versus* American trade and manufactures, in which I find an illustration of the view I hold. The writer, referring to the circumstance that in the United States as in Britain there has been all over the country great suffering and distress from the "hard times,"—goes on to say:—

"At the present period trade and agriculture, although far from being in a prosperous condition, are steadily, if slowly, improving, and mainly in consequence of the strenuous efforts being made on every hand to secure an export trade for American products. The press is constantly and persistently urging manufacturers and producers to push their goods into every quarter where English goods have heretofore held the markets, and there is considerable crowing from time to time about American cutlery being sold in Sheffield, American cotton goods in Manchester, &c. In fact, American export trade is the question of the day, day after day. You hear it talked of in the hotels, on steamboats, railway trains, as you pass along the streets, at private parties, and everywhere, at all times, and in all places; so that a great stimulus is given to merchants to put forth efforts to make the United States England's successor as the leading commercial nation of the world. 'England has had her day, and she must now take a back seat and make way for the United States.' I have read this in the newspapers repeatedly, and heard it and such like expressions daily for many months past.

"I think a good deal of encouragement has been given to Americans in this direction by the English press (the *Colonies* included), by reproducing articles from American papers, and by setting forth editorially the superiority of American wares over those of English production, thus in England giving American producers an immense amount of gratuitous advertising; and no doubt the articles from the English papers are reproduced in the colonial press, and thus further help is given to Americans in extending their trade. I suppose it is all right, but it seems to me that the English papers should exercise careful discrimination, and not too readily decry home manufactures as so much inferior to American goods.

"My own observation convinces me that what is needed most in England is

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to *educate and lift up* the industrial classes (I know that for some few years past great progress has been made in that direction), to the end that they may bring to their work a greater intelligence—that is to say, that their *heads* shall assist their hands.

"I have had considerable opportunities of judging as to the relative skill of American to English artisans, and, leaving out of account certain specialities peculiar to American requirements, I am quite sure that the best American mechanics turn out no better *hand*-work than the average English mechanic; but the average American mechanic is far more temperate in his habits, is undoubtedly better educated, and, as a workman, he turns his "schooling" to advantage by reading up and keeping himself posted on all matters relating to his special branch of industry; as a result, the American artisan is much given to 'improving' things.

"Americans have the reputation, and justly so, of being ahead of all others in fertility of invention. However, the 'intelligent foreigner' domiciled here does his full share of inventing, being greatly stimulated thereto by the ease and cheapness of obtaining a patent; but, of all nationalities, the American is the greatest 'improver' of things; no matter how trifling in value the article may be, or how humble its purpose, he likes it to be attractive in appearance. It may be a clothes-peg, or a toasting-fork, or the humblest article of kitchen furniture, he will *shape* it with an artistic taste. In fact, the American turns out not better *hand*-work, but better *head*-work, than the Englishman, and, as a rule, he will give you an article containing less material yet stronger than that his English cousin would produce for a like purpose; all this because he is better posted in all that is going on in his line. His head assists his hands in all they do.

"In England I believe that trade journals are read mostly by the employers, and that, as a rule, artisans know little or nothing that is being done in their special branch of industry beyond the place in which they are employed. Many a poor fellow over there is an 'excellent hand' at the sort of work he has been taught to do, but he works like a machine, and would be unable to read a trade journal if given to him. Thank God, the board schools will change all that before another generation, and then the English artisan will be the equal in head as he is now in hand to those of any other nationality.

"Were I an English manufacturer I would—as some large establishments do in this country—encourage my workmen to read by placing before them a number of industrial newspapers, and, inviting each to choose his own paper, make them every one a Christmas present by subscribing for the papers for one year.

"Another thing here, a mechanic has more freedom of action accorded to him; an American 'boss' is nearly always willing to listen to a suggestion from his workmen, and to act on it if found worth adoption; while in too many instances an English mechanic would be considered presumptuous, and meet with a rebuff, were he to offer to teach his 'master' anything new."

I have written mainly of what corresponds to the Primary Forest School of the Continent. But the title of my paper is more comprehensive. It speaks of Rural Primary Schools of Science, Agriculture, Forestry, and Rural Economy."

By the Highland and Agricultural Society of Scotland arrangements have been made for granting certificates in agriculture and in forestry after prescribed examinations; but so far as is known to me, with the

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exception of a professorship of agriculture in the University of Edinburgh and the Fordyce lectureship in the University of Aberdeen, there does not exist in Scotland any provision for public instruction in agriculture, or in the United Kingdom, excepting besides these the Royal Agricultural College at Cirencester. For instruction in forestry no provision has yet been made in any country in which the English language is spoken; and there are not a few other subjects connected with rural economy the study of which might easily be combined with the study of agriculture and forestry, but for the study of these no separate provision has been made in Britain, excepting for the study of veterinary surgery.

And whether the circumstance that the same preliminary studies in science and natural history which fit for engaging with advantage in agriculture, forestry, or rural economy may be studied by aspirants to these different occupations at the same time, in the same class, be considered an advantage or a disadvantage, as it may be, according to the point of view whence it may be regarded, the comprehensive character of such a school may secure for it more extended sympathy and countenance, and an attendance of pupils and students which would justify what may be done, where this would not be the case if the school were of a more special character.

Through any one of the 1,500 committees to whom the superintendence of science schools and classes in different parts of the United Kingdom is entrusted, or by the formation of a like committee in any place, a connection with the Science and Art Department may be effected.

It is the case that the great majority of the science schools and classes for instruction in which payments are made by the Department are taught by a single recognised teacher—and there may be but a single class studying drawing or mathematics; but not a few of them have a large staff of teachers, some of them as many as eight, nine, and ten, some of whom may give instruction in the more difficult subjects; and there is nothing to prevent a teacher of the principles of agriculture supplementing the instruction he gives to his general class on subject 23, "Woods and Plantations," by special instruction to students of forestry. Or, as has been intimated, some intelligent forester living in the vicinity of any school of science might be induced to give class instruction, with occasional practical demonstrations in the field. And be it noted that it is not required in order to obtain the aid of the Department that more than one of the subjects specified by them should be taught.

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